IBM BladeCenter HS23E

IBM Redbooks Product Guide

The IBM® BladeCenter® HS23E is a versatile, dual-socket blade server running the Intel Xeon processor E5-2400 product family. The server offers performance for value with new levels of memory capacity, processor performance, and flexible configuration options. A standard 30 mm single-wide form factor protects your investments by providing compatibility with the IBM BladeCenter H, E, S, and HT chassis.

Suggested use: Collaboration/email, infrastructure, virtualization, databases, and office-in-a-box solutions.

The following figure shows the HS23E.

Figure 1. IBM BladeCenter HS23E

Did you know

The IBM BladeCenter HS23E provides flexible configuration options coupled with value for performance and density to keep data centers operating optimally while maintaining energy efficiency. Its features include the latest Intel Xeon processor E5-2400 product family, choice of hot-swap HDDs and SSDs for tailored storage, and 12 DIMM slots supporting up to 192 GB of DDR3 memory. A cost-effective onboard software RAID solution offers affordable local storage redundancy. IBM Virtual Fabric capabilities offer support for up to 12 I/O ports on a single-wide blade with the choice of Ethernet, Fibre Channel, SAS, iSCSI, and FCoE connectivity.

Key features

The IBM BladeCenter HS23E is a performance for value blade server optimized for energy efficiency and density by offering flexible configuration options. Designed specifically for use in business critical and entry virtualization applications, the blade offers higher performance with 1600 MHz memory and optimal processor performance in a standard 30 mm form factor. The HS23E supports the latest Intel Xeon processor E5-2400 product family, two ports of 1 Gb Ethernet, high-capacity, high-throughput memory, and high speed I/O, including Virtual Fabric adapters for IBM BladeCenter. In addition, the HS23E is compatible with BladeCenter E, S, H, and HT chassis. (Some configurations may have limitations. See Table 5 for compatibility details.)

Scalability and performance

The HS23E offers numerous features to boost performance, improve scalability, and reduce costs:

- The Intel Xeon processor E5-2400 product family improves productivity by offering affordable dual-socket system performance with eight-core processors with up to 2.3 GHz core speeds, up to 20 MB of L3 cache, and one QPI interconnect link of up to 8 GTps.

- Up to two processors, 16 cores, and 32 threads maximize the concurrent execution of multithreaded applications.

- Intelligent and adaptive system performance with Intel Turbo Boost Technology 2.0 allows processor cores to run at maximum speeds during peak workloads by temporarily going beyond processor thermal design power (TDP).

- Intel Hyper-Threading Technology boosts performance for multithreaded applications by enabling simultaneous multithreading within each processor core, up to two threads per core.

- Intel Virtualization Technology integrates hardware-level virtualization hooks that allow operating system vendors to better use the hardware for virtualization workloads.

- Intel Advanced Vector Extensions (AVT) improve floating point performance for compute-intensive technical and scientific applications.

- Up to 12 DDR3 ECC memory RDIMMs provide speeds up to 1600 MHz and a memory capacity of up to 192 GB. (See Table 7 for details.)

- The theoretical maximum memory bandwidth of the Intel Xeon processor E5-2400 product family is 38.4 GBps, which is 20% more than the previous generation of Intel Xeon 5600 processors.

- The use of solid-state drives (SSDs) instead of or along with traditional hard disk drives (HDDs) can improve I/O performance. An SSD can support up to 100 times more I/O operations per second (IOPS) than a typical HDD.

- The HS23E scales to 12 I/O ports on a single-wide blade with integrated Gigabit Ethernet and optional expansion cards, offering the choice of Ethernet, Fibre Channel, SAS, iSCSI, and FCoE connectivity.

- The server offers PCI Express 3.0 I/O expansion capabilities that improve the theoretical maximum bandwidth by almost 100% (8 GTps per link using 128b/130b encoding) compared to the previous generation of PCI Express 2.0 (5 GTps per link using 8b/10b encoding).

- With Intel Integrated I/O Technology, the PCI Express 3.0 controller is integrated into the Intel Xeon processor E5 family. This integration helps to reduce I/O latency and increase overall system performance.

Availability and serviceability

The HS23E provides many features to simplify serviceability and increase system uptime:

- Dual independent power and signal connectors to the BladeCenter chassis midplane provide fault tolerance to increase uptime.

- The HS23E offers Chipkill, memory mirroring, and memory rank sparing for redundancy in the event of a non-correctable memory failure to prevent unplanned outages.

- Tool-less cover removal provides easy access to upgrades and serviceable parts, such as processor, memory, and adapter cards.

- The server offers hot-swap drives supporting affordable software RAID 1 or optional hardware RAID redundancy for data protection and greater system uptime.

- The power source independent light path diagnostics panel and individual light path LEDs quickly lead the technician to failed (or failing) components. This panel simplifies servicing, speeds up problem resolution, and helps improve system availability.

- Predictive Failure Analysis (PFA) detects when system components (memory and hard disk drives) operate outside of standard thresholds and generates proactive alerts in advance of possible failure, therefore increasing uptime.

- Solid-state drives (SSDs) offer better reliability than traditional HDDs for greater uptime.

- A built-in Integrated Management Module II (IMM2) continuously monitors system parameters, triggers alerts, and performs recovery actions in case of failures to minimize downtime.

- Built-in diagnostics using Dynamic Systems Analysis (DSA) Preboot speeds up troubleshooting tasks to reduce service time.

- Three-year customer replaceable unit and on-site limited warranty, next business day 9x5. Optional service upgrades are available.

Manageability and security

Powerful systems management features simplify local and remote management of the HS23E:

- The HS23E includes an Integrated Management Module II (IMM2) to monitor server availability and perform remote management.

- An integrated industry-standard Unified Extensible Firmware Interface (UEFI) enables improved setup, configuration, and updates, and simplifies error handling.

- Integrated Trusted Platform Module (TPM) V1.2 support enables advanced cryptographic functionality, such as digital signatures and remote attestation.

- Industry-standard AES NI support provides faster and stronger encryption.

- IBM Systems Director offers comprehensive systems management tools that help to increase up-time, reduce costs, and improve productivity through advanced server management capabilities.

- IBM Fabric Manager simplifies deployment of infrastructure connections by managing network and storage address assignments.

- IBM FastSetup simplifies, automates, and speeds up the deployment process from server power-up to production, making the BladeCenter system easier to manage, deploy, and maintain.

- Intel Execute Disable Bit functionality can help prevent certain classes of malicious buffer overflow attacks when combined with a supporting operating system.

- Intel Trusted Execution Technology provides enhanced security through hardware-based resistance to malicious software attacks, allowing an application to run in its own isolated space.

Energy efficiency

The HS23E offers the following energy-efficiency features to save energy, reduce operational costs, increase energy availability, and contribute to the green environment:

- The component-sharing design of the BladeCenter chassis provides ultimate power and cooling savings.

- Energy-efficient planar components help lower operational costs.

- The Intel Xeon processor E5-2400 product family offers better performance over the previous generation, while fitting into the same TDP limits.

- Intel Intelligent Power Capability powers individual processor elements on and off as needed, to reduce power draw.

- Low-voltage Intel Xeon processors draw less energy to satisfy demands of power and thermally constrained data centers and telecommunication environments.

- Low-voltage 1.35 V DDR3 memory RDIMMs consume 19% less energy than 1.5 V DDR3 RDIMMs.

- Solid-state drives (SSDs) consume as much as 80% less power than traditional 2.5-inch HDDs.

- The HS23E uses hexagonal ventilation holes, a part of IBM Calibrated Vectored Cooling™ technology. Hexagonal holes can be grouped more densely than round holes, providing more efficient airflow through the system.

- IBM Systems Director Active Energy Manager™ provides advanced power management features with actual real-time energy monitoring, reporting, and capping features.

Locations of key components and connectors

The following figure shows the front view of the server, indicating key components.
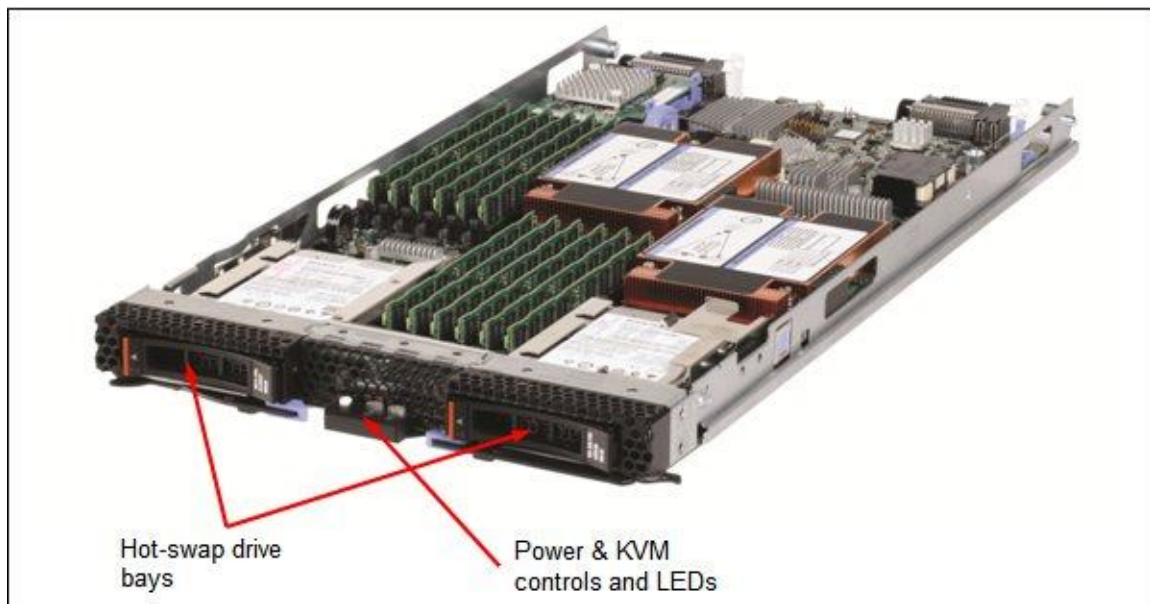

Figure 2. Front view of the IBM BladeCenter HS23E

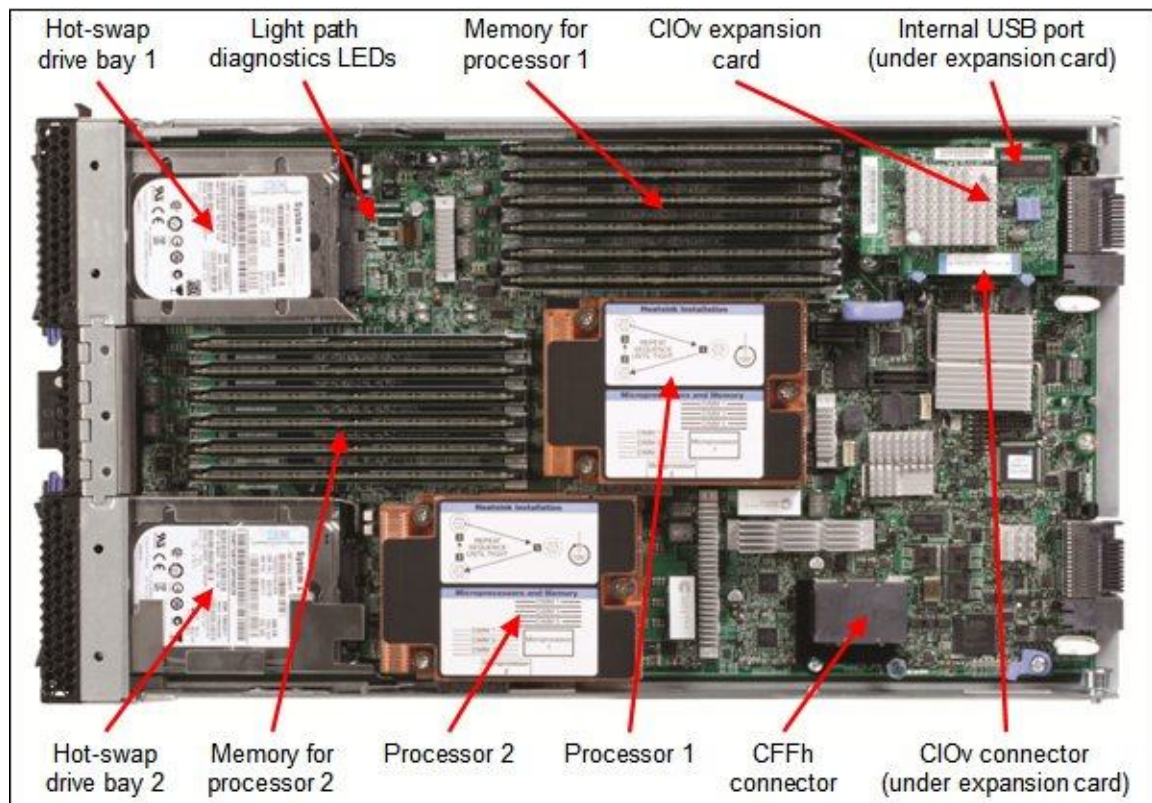The following figure shows the top view of the server, indicating key components.

Figure 3. Top view of the IBM BladeCenter HS23E

Standard specifications

The following table lists the standard specifications.

Table 1. Standard specifications (part 1)

Components	Specifications
Form factor	Single-wide (30 mm) blade server.
Chassis support	BladeCenter H, BladeCenter HT, BladeCenter S, and BladeCenter E. (Some configurations may have limitations. See Table 5 for compatibility details.)
Processor	Up to two Intel Xeon processor E5-2400 product family processors with eight cores (up to 2.3 GHz), six cores (up to 2.4 GHz), or four cores (up to 2.2 GHz), one QPI link up to 8.0 GTps, up to 1600 MHz memory speed, up to 20 MB L3 cache; or one Intel Xeon processor E5-1410 with four cores at 2.8 GHz, 10 MB L3 cache, and 1333 MHz memory speed; or one Intel Pentium processor 1400 product family with two cores up to 2.8 GHz, 5 MB L3 cache, and 1066 MHz memory speed.
Chipset	Intel C600 Series.
Memory	Up to 12 DDR3 DIMM sockets (six DIMMs per processor) using Very Low Profile (VLP) DIMMs. Support for up to 1600 MHz memory speed depending on the processor. Three memory channels per processor (two DIMMs per channel).
Memory maximums	Up to 192 GB with 12x 16 GB RDIMMs and two processors.
Memory protection	ECC, Chipkill, memory mirroring, and memory sparing.
Drive bays	Two 2.5-inch SAS/SATA hot-swap drive bays supporting SAS/SATA HDDs and SSD drives.
Maximum internal storage	Up to 1.8 TB with 900 GB 2.5-inch SAS HDDs, up to 2 TB with 1 TB 2.5-inch NL SAS or SATA HDDs, or up to 1.6 TB with 800 GB 2.5-inch SAS SSDs. An intermix of SAS and SATA HDDs and SSDs is supported with the optional H1135.
RAID support	RAID 0 and 1 with C105 (support for SATA HDDs only). Optional RAID 0, 1, 10, and 1E with H1135 (support for SAS/SATA HDDs and SSDs).
Network interfaces	Two Gigabit Ethernet ports with an integrated Broadcom BCM5718 controller.
PCI Expansion slots	One CIOv slot (PCIe 3.0 x8) and one CFFh slot (PCIe 3.0 x16). Two additional PCIe 2.0 x8 standard form factor slots (slot 1 is full-height full-length, slot 2 is full-height half-length) with the optional PCI Express Gen 2 Expansion Blade II. One HS23E supports up to four PCIe expansion blades (8 slots). Up to four optional GPU expansion blades with either NVIDIA Tesla M2090, M2075, or M2070Q graphics processing units.
Ports	One internal USB port (for embedded hypervisor).
Hot-swap components	Hard drives and solid state drives.
Systems management	UEFI, Renesas SH7757 controller-based IBM Integrated Management Module II (IMM2) with remote presence (graphics, keyboard and mouse, and virtual media), Predictive Failure Analysis, light path diagnostics panel, Automatic Server Restart, IBM Systems Director, IBM Systems Director Active Energy Manager, IBM ServerGuide, and IBM FastSetup.
Security features	Power-on password, administrator's password, and Trusted Platform Module (TPM) V1.2.

Table 1. Standard specifications (part 2)

Components	Specification
Video	Matrox G200eR2 video core with 16 MB video memory integrated into the IMM2. The maximum resolution is 1600x1200 at 75 Hz with 16 M colors (32 bits per pixel).
Operating systems supported	Microsoft Windows Server 2008 R2 and 2008 (x64), Red Hat Enterprise Linux 5 (x64) and 6 (x86 and x64), SUSE Linux Enterprise Server 10 (x64) and 11 (x86 and x64), VMware ESX 4.1 and VMware ESXi 4.1 embedded hypervisor, VMware vSphere 5 and 5.1. Details in "Supported operating systems".
Limited warranty	3-year customer-replaceable unit and on-site limited warranty with 9x5/next business day (NBD) response time.
Service and support	Optional service upgrades (country-specific) are available through IBM ServicePac® offerings: 4-hour or 2-hour response time, 8-hour fix time, 1-year or 2-year warranty extension, remote technical support for IBM hardware and selected IBM and third-party (Microsoft, Linux, VMware) software.
Dimensions	Height: 245 mm (9.6 in.), width: 29 mm (1.14 in.), depth: 446 mm (17.6 in.)
Weight	Maximum configuration (single-wide blade): 4.6 kg (10.2 lb).

The IBM BladeCenter HS23E servers are shipped with the following items:

- Documentation CD containing *Installation and User's Guide*
- Registration Flyer
- Statement of Limited Warranty
- Important Notices

Standard models

The following table lists standard models.

Table 2. Standard models

MTM*	Intel Xeon processor† (2 maximum)	Memory	RAID	Drive bays (used/max)	Drives	Onboard NIC	I/O slots (used/max)
8038-B1x	1x E5-2403 4C 1.8GHz 10MB 1066MHz 80W	1x 2 GB 1066 MHz§	C105	0 / 2	Open bay	2x 1 GbE	0 / 2
8038-B3x	1x E5-2407 4C 2.2GHz 10MB 1066MHz 80W	3x 4 GB 1066 MHz§	C105	0 / 2	Open bay	2x 1 GbE	0 / 2
8038-C2x	1x E5-2430 6C 2.2GHz 15MB 1333MHz 95W	3x 4 GB 1333 MHz	C105	0 / 2	Open bay	2x 1 GbE	0 / 2
8038-C3x	1x E5-2440 6C 2.4GHz 15MB 1333MHz 95W	3x 4 GB 1333 MHz	C105	0 / 2	Open bay	2x 1 GbE	0 / 2
8038-C4x	1x E5-2430 6C 2.2GHz 15MB 1333MHz 95W	3x 8 GB 1333 MHz	C105	0 / 2	Open bay	2x 1 GbE	0 / 2
8038-D1x	1x E5-2450 8C 2.1GHz 20MB 1600MHz 95W	3x 8 GB 1600 MHz	C105	0 / 2	Open bay	2x 1 GbE	0 / 2
8038-D2x	1x E5-2450 8C 2.1GHz 20MB 1600MHz 95W	3x 8 GB 1600 MHz	C105	0 / 2	Open bay	2x 1 GbE	0 / 2
8038-D3x	1x E5-2470 8C 2.3GHz 20MB 1600MHz 95W	3x 8 GB 1600 MHz	C105	0 / 2	Open bay	2x 1 GbE	0 / 2
8038-D4x	1x E5-2470 8C 2.3GHz 20MB 1600MHz 95W	3x 8 GB 1600 MHz	C105	0 / 2	Open bay	2x 1 GbE	0 / 2
8038-F1x	1x Pentium 1403 2C 2.6GHz 5MB 1066MHz 80W	1x 2 GB 1066 MHz§	C105	0 / 2	Open bay	2x 1 GbE	0 / 2
8038-F2x	1x Pentium 1407 2C 2.8GHz 5MB 1066MHz 80W	3x 4 GB 1066 MHz§	C105	0 / 2	Open bay	2x 1 GbE	0 / 2

* x in the Machine Type Model (MTM) represents a country-specific letter (for example, the EMEA MTM is 8038B1G, and the US MTM is 8038B1U). Ask your local IBM representative for specifics.
† Processor detail: Processor quantity and model, number of cores, core speed, L3 cache, memory speed, TDP.
§ For models B1x, B3x, F1x, and F2x, the standard DIMMs are rated at 1333 MHz, but operate at up to 1066 MHz to match the processor memory speed. Actual memory speed maximums depend on several factors, as described in "Memory options".

Express models

The following table lists the Express models.

Table 3. Express models

Model	Intel Xeon processor† (2 maximum)	Memory	RAID	Drive bays (used/max)	Drives	Onboard NIC	I/O slots (used/max)
United States, Latin America, Canada							
8038-E1U	1x E5-2420 6C 1.9GHz 15MB 1333MHz 95W	3x 8 GB 1333 MHz	C105	0 / 2	Open bay	2x 1 GbE	0 / 2
8038-E2U	1x E5-2407 4C 2.2GHz 10MB 1066MHz 80W	3x 4 GB 1066 MHz§	C105	0 / 2	Open bay	2x 1 GbE	0 / 2
8038-E3U	2x E5-2430 6C 2.2GHz 15MB 1333MHz 95W	6x 8 GB 1333 MHz	C105	0 / 2	Open bay	2x 1 GbE	0 / 2
8038-E4U	1x E5-2407 4C 2.2GHz 10MB 1066MHz 80W	3x 8 GB 1066 MHz§	C105	0 / 2	Open bay	2x 1 GbE	0 / 2
8038-E5U	1x E5-2430 6C 2.2GHz 15MB 1333MHz 95W	3x 8 GB 1333 MHz	C105	0 / 2	Open bay	2x 1 GbE	0 / 2
8038-E6U	1x E5-2450 8C 2.1GHz 20MB 1600MHz 95W	3x 8 GB 1600 MHz	C105	0 / 2	Open bay	2x 1 GbE	0 / 2
Europe, Middle East, Africa							
8038-K1G	1x E5-2403 4C 1.8GHz 10MB 1066MHz 80W	1x 8 GB 1066 MHz§	C105	0 / 2	Open bay	2x 1 GbE	0 / 2

† Processor detail: Processor quantity and model, number of cores, core speed, L3 cache, memory speed, TDP.
§ For model E2U, E4U and K1G, the standard DIMMs are rated at 1333 MHz, but operate at up to 1066 MHz to match the processor memory speed. Actual memory speed maximums depend on several factors, as described in "Memory options".

Chassis support

The HS23E is supported in the various BladeCenter chassis listed in the following table.
Table 4. Chassis support

Description	BC-E (8677)	BC-T	BC-S (8886)	BC-H (8852)	BC-HT AC (8750)	BC-HT DC (8740)
HS23E - 95W or 80W CPUs	Some limits*	No	Full	Full	Full	Full
HS23E - up to 70W CPUs	Full	No	Full	Full	Full	Full

* See Table 5 for details.

The number of HS23E servers supported in each chassis depends on the TDP of the processors used in the servers (Table 5). Table 5 uses the following conventions:

- A green cell means that the chassis can be filled with HS23E blade servers up to the maximum number of blade bays in the chassis (for example, 14 blades in the BladeCenter H).

- A yellow cell means that the maximum number of HS23E blades that the chassis can hold is fewer than the total available blade bays (for example, 12 in a BladeCenter E). Other bays in the chassis *must* remain empty. Consult the *BladeCenter Interoperability Guide* for specific details: http://ibm.com/support/entry/portal/docdisplay?Indocid=MIGR-5073016

Note: The HS23E is not supported in the BladeCenter E with power supplies smaller than 2000 W.

Table 5. Chassis support (detailed)

CPU TDP*	Maximum number of HS23 servers supported in each chassis									
	BC-E with AMM (8677) (14 bays)		BC-S (8886) (6 bays)	BC-H (models other than 4Tx) (14 bays)				BC-H (-4Tx) (14 bays)	BC-HT AC§ (8750) (12 bays)	BC-HT DC§ (8740) (12 bays)
	2000 W power supplies	2320 W power supplies		2900W supplies		2980W supplies**		2980W		
				Standard blowers	Enhanced blowers†	Standard blowers	Enhanced blowers†	Enhanced blowers†		
Intel Xeon processors										
95W	5+6	14	6	14	14	14	14	14	12	12
80W	5+7	14	6	14	14	14	14	14	12	12
70W	14	14	6	14	14	14	14	14	12	12
60W	14	14	6	14	14	14	14	14	12	12
Intel Xeon robust thermal profile processors#										
70W	14	14	6	14	14	14	14	14	12	12
60W	14	14	6	14	14	14	14	14	12	12
50W	14	14	6	14	14	14	14	14	12	12

* Thermal Design Power.
** IBM BladeCenter H 2980W AC Power Modules, 68Y6601 (standard in 4Tx, optional with all other BC-H models).
† IBM BladeCenter H Enhanced Cooling Modules, 68Y6650 (standard in 4Tx, optional with all other BC-H models).
# Intel Xeon processors E5-2418L (50W), E5-2428L (60W), and E5-2448L (70W) are robust thermal profile processors used in HS23E.
§ Support shown is for non-NEBS environments.

Processor options

The HS23E supports the processor options listed in the following table. The server supports up to two Intel Xeon processor E5-2400 product family processors, one Intel Xeon processor E5-1410, one Intel Pentium processor 1403, or one Intel Pentium processor 1407. This table shows which server models have each processor standard. If there is no corresponding *where used* model for a particular processor, then this processor is only available through Configure to Order (CTO) or special bid.

Table 6. Processor options

Part number	Description	Standard models where used
Single or dual processor support: Intel Xeon processor E5-2400 product family		
90Y5292	Intel Xeon Processor E5-2403 4C 1.8GHz 10MB Cache 1066MHz 80W	B1x, K1G
90Y5291	Intel Xeon Processor E5-2407 4C 2.2GHz 10MB Cache 1066MHz 80W	B3x, E2U, E4U
94Y6288#	Intel Xeon Processor E5-2418L 4C 2.0GHz 10MB Cache 1333MHz 50W	-
90Y5290	Intel Xeon Processor E5-2420 6C 1.9GHz 15MB Cache 1333MHz 95W	E1U
94Y6289#	Intel Xeon Processor E5-2428L 6C 1.8GHz 15MB Cache 1333MHz 60W	-
90Y5288	Intel Xeon Processor E5-2430 6C 2.2GHz 15MB Cache 1333MHz 95W	C2x, C4x, E3U, E5U
90Y5294	Intel Xeon Processor E5-2430L 6C 2.0GHz 15MB Cache 1333MHz 60W	-
90Y5287	Intel Xeon Processor E5-2440 6C 2.4GHz 15MB Cache 1333MHz 95W	C3x
94Y6290#	Intel Xeon Processor E5-2448L 8C 1.8GHz 20MB Cache 1600MHz 70W	-
90Y5286	Intel Xeon Processor E5-2450 8C 2.1GHz 20MB Cache 1600MHz 95W	D1x, D2x, E6U
90Y5293	Intel Xeon Processor E5-2450L 8C 1.8GHz 20MB Cache 1600MHz 70W	-
90Y5284	Intel Xeon Processor E5-2470 8C 2.3GHz 20MB Cache 1600MHz 95W	D3x, D4x
Single processor support only: Intel Xeon processor E5-1410 and Intel Pentium processor 1400 product family		
None*	Intel Pentium Processor 1403 2C 2.6GHz 5MB Cache 1066MHz 80W	F1x
None*	Intel Pentium Processor 1407 2C 2.8GHz 5MB Cache 1066MHz 80W	F2x
None*	Intel Xeon Processor E5-1410 4C 2.8GHz 10MB Cache 1333MHz 80W	-

Intel Xeon robust thermal profile processors.
* These processors support only single processor configurations.

Memory options

IBM DDR3 memory is compatibility tested and tuned for optimal IBM System x® and BladeCenter performance and throughput. IBM memory specifications are integrated into the light path diagnostics panel for immediate system performance feedback and optimum system uptime. From a service and support standpoint, IBM memory automatically assumes the IBM system warranty, and IBM provides service and support worldwide.

The BladeCenter HS23E supports Very Low Profile (VLP) DDR3 memory RDIMMs. The server supports up to six DIMMs when one processor is installed and up to 12 DIMMs when two processors are installed. Each processor has three memory channels, and there are two DIMMs per channel.

The following rules apply when selecting the memory configuration:

- The server supports RDIMMs.
- Mixing 1.5 V and 1.35 V DIMMs in the server is supported. In such a case, all operate at 1.5 V.
- The maximum number of ranks supported per channel is eight.
- The maximum quantity of DIMMs that can be installed in a server depends on the number of processors (six DIMMs with one processor installed, 12 DIMMs with two processors installed).
- All DIMMs in all processor memory channels operate at the same speed, which is determined as the lowest value of:
  - Memory speed supported by specific processor
  - Lowest maximum operating speed for the selected memory configuration that depends on rated speed, as shown under the "Maximum operating speed" section in Table 7.

Table 7. Maximum memory speeds

Specification	RDIMM							
Rank	Single rank			Dual rank			Quad rank	
Part numbers	46C0560 (2 GB) 46C0563 (4 GB) 00D4981 (8 GB)		90Y3147 (4GB) 00D4989 (8GB)	46C0564 (4GB) 46C0568 (8GB 2Rx4) 00D4985 (8GB 2Rx8) 46C0599 (16GB)		90Y3148 (4GB) 90Y3149 (8GB 2Rx4) 00D4993 (8GB 2Rx8)	90Y3221 (16 GB)	
Rated speed	1333 MHz		1600 MHz	1333 MHz		1600 MHz	1066 MHz	
Rated voltage	1.35 V		1.5 V	1.35 V		1.5 V	1.35 V	
Operating voltage	1.35 V	1.5 V	1.5 V	1.35 V	1.5 V	1.5 V	1.35 V	1.5 V
Max quantity*	12	12	12	12	12	12	12	12
Largest DIMM	8 GB	8 GB	8 GB	16 GB	16 GB	8 GB	16 GB	16 GB
Max memory capacity	96 GB	96 GB	96 GB	192 GB	192 GB	96 GB	192 GB	192 GB
Max memory at rated speed	96 GB	96 GB	96 GB	192 GB	192 GB	96 GB	None	None
Maximum operating speed (MHz)								
1 DIMM per channel	1333 MHz	1333 MHz	1600 MHz	1333 MHz	1333 MHz	1600 MHz	800 MHz	800 MHz
2 DIMMs per channel	1333 MHz	1333 MHz	1600 MHz	1333 MHz	1333 MHz	1600 MHz	800 MHz	800 MHz

* Maximum quantity supported is shown for two processors installed. When one processor installed, the maximum quantity supported is half of what is shown.

The following memory protection technologies are supported:

- ECC
- Chipkill (for x4-based memory DIMMs)
- Memory mirroring
- Memory rank sparing

Chipkill works only in independent channel mode (default operational mode) and supports only x4-based memory DIMMs.

If memory mirroring is used, then DIMMs must be installed in pairs (a minimum of one pair per each processor, a maximum of two pairs per processor), and both DIMMs in a pair must be identical in type and size. The effective memory available to the system is only half of that installed.

If memory rank sparing is used, then two single-rank or dual-rank DIMMs or at least one quad-rank DIMM must be installed per populated channel (the DIMMs do not need being identical). In rank sparing mode, one rank of a DIMM in each populated channel is reserved as spare memory. The size of a rank varies depending on the DIMMs installed.

Chipkill, memory mirroring, and memory rank sparing modes are mutually exclusive. Only one operational memory mode can be enabled on a server, and it is a system-wide setting.

Tables 8 lists memory options available for the HS23E server. DIMMs can be installed one at a time, but for performance reasons, install them in sets of three (one for each of the three memory channels).

Table 8. Memory options for the HS23E

Part number	Feature code	Description	Maximum supported	Standard models where used
1066 MHz RDIMMs				
90Y3221	A2QP	16GB (1x16GB, 4Rx4, 1.35V) PC3L-8500 CL7 ECC DDR3 1066MHz VLP RDIMM	12 (6 per processor)	-
1333 MHz RDIMMs				
46C0560	A0WX	2GB (1x2GB, 1Rx8, 1.35V) PC3L-10600 CL9 ECC DDR3 1333MHz VLP DRIMM	12 (6 per processor)	B1x, F1x
46C0563	A0WY	4GB (1x4GB, 1Rx4, 1.35V) PC3L-10600 CL9 ECC DDR3 1333MHz VLP DRIMM	12 (6 per processor)	-
46C0564	A0WZ	4GB (1x4GB, 2Rx8, 1.35V) PC3L-10600 CL9 ECC DDR3 1333MHz VLP DRIMM	12 (6 per processor)	B3x, C2x, C3x, F2x, E2U
00D4981	A3BT	8GB (1x8GB, 1Rx4, 1.35V) PC3L-10600 CL9 ECC DDR3 1333MHz VLP RDIMM	12 (6 per processor)	C4x
46C0568	8644	8GB (1x8GB, 2Rx4, 1.35V) PC3L-10600 CL9 ECC DDR3 1333MHz VLP DRIMM	12 (6 per processor)	E1U, E3U, K1G
00D4985	A3BU	8GB (1x8GB, 2Rx8, 1.35V) PC3L-10600 CL9 ECC DDR3 1333MHz VLP RDIMM	12 (6 per processor)	E4U, E5U
46C0599	2422	16GB (1x16GB, 2Rx4, 1.35V) PC3L-10600 CL9 ECC DDR3 1333MHz VLP DRIMM	12 (6 per processor)	-
1600 MHz RDIMMs				
90Y3147	A1S0	4GB (1x4GB, 1Rx4, 1.5V) PC3-12800 CL11 ECC DDR3 1600MHz VLP RDIMM	12 (6 per processor)	-
90Y3148	A1S1	4GB (1x4GB, 2Rx8, 1.5V) PC3-12800 CL11 ECC DDR3 1600MHz VLP RDIMM	12 (6 per processor)	-
00D4989	A3BV	8GB (1x8GB, 1Rx4, 1.5V) PC3-12800 CL11 ECC DDR3 1600MHz VLP RDIMM	12 (6 per processor)	-
90Y3149	A1S2	8GB (1x8GB, 2Rx4, 1.5V) PC3-12800 CL11 ECC DDR3 1600MHz VLP RDIMM	12 (6 per processor)	D1x, D3x
00D4993	A3BW	8GB (1x8GB, 2Rx8, 1.5V) PC3-12800 CL11 ECC DDR3 1600MHz VLP RDIMM	12 (6 per processor)	D2x, D4x, E6U
90Y3157	A3BS	16GB (1x16GB, 2Rx4, 1.5V) PC3-12800 CL11 ECC DDR3 1600MHz VLP RDIMM	12 (6 per processor)	-

Internal disk storage options

The HS23E server has two hot-swap drive bays accessible from the front of the blade server. These bays are connected to the integrated ServeRAID C105 Controller supplying basic software RAID capabilities for SATA hard drives. An optional ServeRAID H1135 Controller with hardware RAID capabilities is required to support SAS HDDs, SATA SSDs, and external SAS-based storage attachments. The following table lists the RAID controllers used for the internal disk storage of the HS23E server.

Table 9. RAID controllers for internal storage

Part number	Feature code	Description	Maximum supported	Standard models where used
None#	A349	ServeRAID C105 for IBM System x	1	All models
90Y4750	A1XJ	ServeRAID H1135 Controller for IBM Flex System and BladeCenter	1	-

The ServeRAID C105 is an onboard software RAID controller.

The ServeRAID C105 onboard controller has the following specifications:

- Supports up to two internal hot-swap SATA HDDs (SAS HDDs and SSDs are not supported)
- Support for RAID 0 and RAID 1 (non-RAID is not supported)
- 3 Gbps throughput per port
- Support for up to eight volumes
- Support for virtual drive sizes greater than 2 TB
- Fixed stripe unit size of 64 KB
- Support for MegaRAID Storage Manager management software

Important: ServeRAID C105 has no native (in-box) driver for Windows and Linux; the drivers must be downloaded separately. ServeRAID C105 is not supported by VMware, Hyper-V, Xen, and KVM hypervisors.

The ServeRAID H1135 Controller has the following specifications:

- Based on the LSI SAS2004 6 Gbps SAS 4-port controller
- Up to 6 Gbps throughput per port
- CIOv form factor
- PCIe 2.0 x4 host interface
- Two SAS ports routed internally to the two hot-swap drive bays
- Two SAS ports routed externally to the chassis I/O bays 3 and 4
- Support for SAS/SATA HDD and SSD drives
- Support for RAID 0, 1, 1E, and 10, and non-RAID
- Support for up to two RAID volumes
- Support for up to 10 drives in one RAID volume
- Support up to 14 volume drives, including up to two hot-spare drives
- Support for virtual drive sizes greater than 2 TB
- Fixed stripe size of 64 KB
- S.M.A.R.T. support
- Support for MegaRAID Storage Manager management software
- Supports connectivity to the EXP3000, EXP2512, and EXP2524 storage expansion enclosures
- Supports connectivity to the BladeCenter S disk storage modules (via SAS Connectivity Modules or SAS RAID Controller Modules), tape drives, and external storage systems
- Supports operations as a RAID controller for the internal drives and as an HBA for the external storage at the same time

Table 10 lists the hard drive options that are available for internal storage.

Table 10. Disk drive options for internal disk storage

Part number	Feature code	Description	Maximum supported
SAS HDDs			
42D0677	5536	IBM 146GB 15K 6Gbps SAS 2.5" SFF Slim-HS HDD	2
90Y8926	A2XB	IBM 146GB 15K 6Gbps SAS 2.5" SFF G2HS HDD	2
42D0637	5599	IBM 300GB 10K 6Gbps SAS 2.5" SFF Slim-HS HDD	2
90Y8877	A2XC	IBM 300GB 10K 6Gbps SAS 2.5" SFF G2HS HDD	2
81Y9670	A283	IBM 300GB 15K 6Gbps SAS 2.5" SFF HS HDD	2
90Y8913	A2XF	IBM 300GB 10K 6Gbps SAS 2.5" SFF G2HS SED	2
49Y2003	5433	IBM 600GB 10K 6Gbps SAS 2.5" SFF Slim-HS HDD	2
90Y8872	A2XD	IBM 600GB 10K 6Gbps SAS 2.5" SFF G2HS HDD	2
90Y8908	A3EF	IBM 600GB 10K 6Gbps SAS 2.5" SFF G2HS SED	2
81Y9650	A282	IBM 900GB 10K 6Gbps SAS 2.5" Slim-HS HDD	2
81Y9662	A3EG	IBM 900GB 10K 6Gbps SAS 2.5" SFF G2HS SED	2
NL SAS HDDs			
42D0707	5409	IBM 500GB 7200 6Gbps NL SAS 2.5" SFF Slim-HS HDD	2
90Y8953	A2XE	IBM 500GB 7.2K 6Gbps NL SAS 2.5" SFF G2HS HDD	2
81Y9690	A1P3	IBM 1TB 7.2K 6Gbps NL SAS 2.5" SFF Slim-HS HDD	2
NL SATA HDDs			
81Y9722	A1NX	IBM 250GB 7.2K 6Gbps SATA 2.5" SFF Slim-HS HDD	2
81Y9726	A1NZ	IBM 500GB 7.2K 6Gbps SATA 2.5" SFF Slim-HS HDD	2
81Y9730	A1AV	IBM 1TB 7.2K 6Gbps SATA 2.5" SFF Slim-HS HDD	2
SATA SSDs			
00W1125	A3HR	IBM 100GB SATA 2.5" MLC HS Enterprise SSD	2
43W7718	A2FN	IBM 200GB SATA 2.5" SFF Slim-HS SSD	2
49Y5839	A3AS	IBM 64GB SATA 2.5" MLC HS Enterprise Value SSD	2
90Y8648	A2U4	IBM 128GB SATA 2.5" MLC HS Enterprise Value SSD	2
90Y8643	A2U3	IBM 256GB SATA 2.5" MLC HS Enterprise Value SSD	2
49Y5844	A3AU	IBM 512GB SATA 2.5" MLC HS Enterprise Value SSD	2
SAS SSDs			
49Y6129	A3EW	IBM 200GB SAS 2.5" MLC HS Enterprise SSD	2
49Y6134	A3EY	IBM 400GB SAS 2.5" MLC HS Enterprise SSD	2
49Y6139	A3F0	IBM 800GB SAS 2.5" MLC HS Enterprise SSD	2

Important: ServeRAID H1135 is required for solid-state drives or SAS hard drives.

Internal tape drives

The server does not support an internal tape drive. However, it can be attached to the external tape drives using SAS or Fibre Channel connectivity (see Table 25).

Optical drives

The server does not support an optical drive option. However, it does interface to the optical drive installed in the BladeCenter chassis media tray if one is installed there.

I/O expansion options

The HS23E server offers the following PCI Express 3.0 slots:

- CIOv expansion slot: PCIe 3.0 x8
- CFFh expansion slot: PCIe 3.0 x16

The CIOv I/O expansion connector provides I/O connections through the midplane of the chassis to modules located in bays 3 and 4 of a supported BladeCenter chassis. The CFFh I/O expansion connector provides I/O connections to high-speed switch modules that are located in bays 7, 8, 9, and 10 of a BladeCenter H or BladeCenter HT chassis, or to switch bay 2 in a BladeCenter S chassis.

The HS23E optionally supports the PCI Express Gen 2 Expansion Blade II listed in Table 11. The expansion blade provides the capability to attach selected PCI Express cards to the HS23E. This capability is ideal for many applications that require special telecommunications network interfaces or hardware acceleration using a PCI Express card. The expansion blade provides one full-height and full-length PCI Express 2.0 x16 (x8-wired) slot and one full-height and half-length PCI Express 2.0 x16 (x8-wired) slot with a maximum power usage of 75 watts for each slot. It integrates PCI Express card support capability into the BladeCenter architecture. Up to four expansion blades can be attached to an HS23E. Each expansion blade occupies a bay in the BladeCenter chassis.

Table 11. PCIe expansion blades

Part number	Feature codes	Description	Maximum supported
68Y7484	A247	IBM BladeCenter PCI Express Gen 2 Expansion Blade II	4

The HS23E server optionally supports GPU Expansion Blade II expansion units listed in Table 12. This capability is ideal for many applications written to take advantage of acceleration and visualization performance advantages that are offered in general-purpose computing on GPUs. This product ships integrated with one NVIDIA Tesla M2090, one NVIDIA Tesla M2075, or one NVIDIA Tesla M2070Q GPU. The stacking capability of the IBM BladeCenter GPU Expansion Blade II allows you to connect up to four of them to a single blade server. In addition, you can still use a CFFh I/O expansion card adapter by installing it in the top-most expansion blade. Each expansion blade occupies a bay in the BladeCenter chassis.

Table 12. GPU expansion blades

Part number	Feature code	Description	Maximum supported
00D6881	A2VW	IBM BladeCenter GPU Expansion Blade II with NVIDIA Tesla M2090	4
68Y7478	A245	IBM BladeCenter GPU Expansion Blade II with NVIDIA Tesla M2075	4
68Y7479	A246	IBM BladeCenter GPU Expansion Blade II with NVIDIA Tesla M2070Q	4

For more information, see the following IBM Redbooks Product Guide publications:

- *IBM BladeCenter PCI Express Gen 2 Expansion Blade and PCI Express Gen 2 Expansion Blade II* at:
  http://www.redbooks.ibm.com/abstracts/tips0783.html?Open

- *IBM BladeCenter GPU Expansion Blade and GPU Expansion Blade II* at:
  http://www.redbooks.ibm.com/abstracts/tips0798.html?Open

Network adapters

The HS23E offers two integrated Gigabit Ethernet ports with the onboard Broadcom BCM5718 controller. These ports are routed to the chassis I/O bays 1 and 2 in BladeCenter H, BladeCenter HT and BladeCenter E. On BladeCenter S, the two onboard ports are both routed to the chassis I/O bay 1.

The integrated dual-port NIC has the following features:

- Two Gigabit Ethernet ports with BCM5718 ASIC

- Full-duplex (FDX) capability

- IEEE 802.3x FDX flow control

- I/O virtualization support for VMware NetQueue and Microsoft VMQ

- Function Level Reset (FLR)

- IPv4/IPv6 offload:
    - TCP, IP, and UDP checksum offload
    - Large send offload (LSO)
    - TCP segmentation offload (TSO)
    - Receive side scaling (RSS)
    - Transmit-side scaling (TSS)

- IEEE 802.1Q VLAN tagging

- VLAN insertion and extraction

- Jumbo frames up to 9,600 bytes

- Load balancing and failover teaming support, including adapter fault tolerance (AFT), switch fault tolerance (SFT), adaptive load balancing (ALB), and IEEE 802.3ad

- Supports Serial over LAN (SoL) and concurrent KVM (cKVM)

- Preboot Execution Environment (PXE) support

- Wake On LAN support

- PCIe 2.0 x1 host interface

- Message Signal Interrupt (MSI-X) support

Table 13 lists additional supported network adapters and upgrades.

Table 13. Network adapters

Part number	Feature code	Description	Slots supported	Maximum supported
Virtual Fabric Adapters and Upgrades				
81Y3133	A1QR	Broadcom 2-port 10Gb Virtual Fabric Adapter	CFFh	1
None#	A1XG	Emulex 10GbE Virtual Fabric Adapter II	CFFh	1
None#	A1XH	Emulex 10GbE Virtual Fabric Adapter Advanced II	CFFh	1
00Y3266†	A3NV	Emulex 10GbE Virtual Fabric Adapter II	CFFh	1
00Y3264†	A3NW	Emulex 10GbE Virtual Fabric Adapter Advanced II	CFFh	1
49Y4265	2436	Emulex 10GbE Virtual Fabric Advanced Upgrade	(License only)	1*
Converged Network Adapters				
81Y1650	5437	Brocade 2 port 10GbE Converged Network Adapter (CFFh)	CFFh	1
00Y3280	A3JB	QLogic 2-port 10Gb CNA (CFFh) (replaces 42C1830)	CFFh	1
42C1830**	3592	QLogic 2-pt 10Gb Converged Network Adapter (CFFh)	CFFh	1
10 Gb Ethernet				
46M6168	0099	Broadcom 10Gb Gen2 2-port Ethernet Expansion Card (CFFh)	CFFh	1
46M6164	0098	Broadcom 10Gb Gen2 4-port Ethernet Expansion Card (CFFh)	CFFh	1
42C1810	3593	Intel 10Gb 2-port Ethernet Expansion Card (CFFh)	CFFh	1
1 Gb Ethernet				
44W4479	5476	2/4 Port Ethernet Expansion Card (CFFh)	CFFh	1
44W4475	5477	Ethernet Expansion Card (CIOv)	CIOv	1
InfiniBand				
46M6001	0056	2-port 40Gb InfiniBand Expansion Card (CFFh)	CFFh	1

\# These adapters are only available through CTO or special bid.
† These options are refreshed offerings of the existing VFA II adapters (feature codes A1XG and A1XH). The new adapters support pNIC, vNIC1, and vNIC2 out-of-box, while the existing adapters require the firmware upgrade to support vNIC2 functionality (pNIC and vNIC1 is supported out-of-box).
* Software Feature on Demand (FoD) upgrade for Emulex Virtual Fabric Adapter and Adapter II cards.
** Withdrawn, not available for ordering.

For more information, see the list of IBM Redbooks Product Guides in the Ethernet adapters category:
http://www.redbooks.ibm.com/portals/BladeCenter?Open&page=pg&cat=ethadapters

Storage host bus adapters

The following table lists storage HBAs supported by the HS23E server.

Table 14. Storage adapters

Part number	Feature code	Description	Slots supported	Maximum supported
Fibre Channel				
46M6140	3598	Emulex 8Gb Fibre Channel Expansion Card (CIOv)	CIOv	1
00Y3270	A3JC	QLogic Enet and 8Gb FC Exp Card (CFFh) (replaces 44X1940)	CFFh	1
44X1940*	5485	QLogic Eth and 8Gb Fibre Channel Exp Card (CFFh)	CFFh	1
44X1945	1462	QLogic 8Gb Fibre Channel Expansion Card (CIOv)	CIOv	1
46M6065	3594	QLogic 4Gb Fibre Channel Expansion Card (CIOv)	CIOv	1
SAS				
90Y4750	A1XJ	ServeRAID H1135 Controller (CIOv)	CIOv	1

* Withdrawn, not available for ordering.

For more information, see the list of IBM Redbooks Product Guides in the Fibre Channel adapters category:
http://www.redbooks.ibm.com/portals/BladeCenter?Open&page=pg&cat=fcadapters

PCIe SSD adapters

The HS23E server supports the High IOPS SSD adapters listed in Table 15. The adapters must be installed in an IBM BladeCenter PCI Express Gen 2 Expansion Blade II. Up to eight High IOPS adapters supported per one HS23E (two per PCI Express Gen 2 Expansion Blade II and up to four PCI Expansion Blades per HS23E).

Table 15. SSD adapters

Part number	Feature code	Description	Slots supported	Max supported (per exp. blade / per HS23E)
46C9078	A3J3	IBM 365GB High IOPS MLC Mono Adapter	PCIe Gen 2 Expansion Blade II (68Y7484)	2 / 8
46C9081	A3J4	IBM 785GB High IOPS MLC Mono Adapter	PCIe Gen 2 Expansion Blade II (68Y7484)	2 / 8
90Y4377	A3DY	IBM 1.2TB High IOPS MLC Mono Adapter	PCIe Gen 2 Expansion Blade II (68Y7484)	2 / 8
90Y4397	A3DZ	IBM 2.4TB High IOPS MLC Duo Adapter	PCIe Gen 2 Expansion Blade II (68Y7484)	2 / 8

For information about this adapter, see the *IBM High IOPS MLC Adapters* Product Guide:
http://www.redbooks.ibm.com/abstracts/tips0907.html?Open

Power supplies

The server power is derived from the power supplies installed in the BladeCenter chassis. There are no server options regarding power supplies.

Integrated virtualization

The server supports VMware ESXi installed on a USB memory key. The key is installed in a USB socket inside the server. The following table lists the virtualization options.

Table 16. Virtualization options

Part number	Feature code	Description	Maximum supported
41Y8298	A2G0	IBM Blank USB Memory Key for VMware ESXi Downloads	1
41Y8300	A2VC	IBM USB Memory Key for VMWare ESXi 5.0	1
41Y8311	A2R3	IBM USB Memory Key for VMWare ESXi 5.1	1

Remote management

The server contains an IBM Integrated Management Module II (IMM2), which is based on the Renesas SH7757 chip, and interfaces with the advanced management module in the BladeCenter chassis. The combination of these provides advanced service-processor control, monitoring, and an alerting function. If an environmental condition exceeds a threshold or if a system component fails, LEDs on the system board are lit to help you diagnose the problem, the error is recorded in the event log, and you are alerted to the problem. A virtual presence capability comes standard for remote server management through the Advanced Management Module (AMM) in the BladeCenter chassis.

Remote server management is provided through industry-standard interfaces:

- Simple Network Management Protocol (SNMP) Version 3
- Systems Management Architecture for Server Hardware (SMASH)
- Web browser

The server also supports virtual media and remote control features, which provide the following functions:

- Remotely viewing video with graphics resolutions up to 1600x1200 at 75 Hz with up to 23 bits per pixel, regardless of the system state
- Remotely accessing the server using the keyboard and mouse from a remote client
- Mapping the CD or DVD drive, diskette drive, and USB flash drive on a remote client, and mapping ISO and diskette image files as virtual drives that are available for use by the server
- Capturing blue-screen errors

Supported operating systems

The server supports the following operating systems:

- Microsoft Windows Server 2012
- Microsoft Windows Server 2008 R2
- Microsoft Windows Server 2008, Datacenter x64 Edition

- Microsoft Windows Server 2008, Enterprise x64 Edition
- Microsoft Windows Server 2008, Web x64 Edition
- Microsoft Windows Server 2008 HPC Edition
- Red Hat Enterprise Linux 6 Server Edition
- Red Hat Enterprise Linux 6 Server x64 Edition
- Red Hat Enterprise Linux 5 Server with Xen x64 Edition
- Red Hat Enterprise Linux 5 Server x64 Edition
- Red Hat Enterprise Linux 5 Server Edition
- SUSE LINUX Enterprise Server 11 for AMD64/EM64T
- SUSE LINUX Enterprise Server 11 for x86
- SUSE LINUX Enterprise Server 11 with Xen for AMD64/EM64T
- SUSE LINUX Enterprise Server 10 for AMD64/EM64T
- VMware vSphere 5.1
- VMware vSphere 5.0
- VMware ESX 4.1
- VMware ESXi 4.1

Important: ServeRAID C105 is not supported by VMware. If local drive access is required for VMware, ServeRAID H1135 should be used.

For the latest information about the specific versions and service levels supported and any other prerequisites, see the IBM ServerProven® website at:
http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/nos/ematrix.shtml

Physical specifications

Dimensions and weight (approximate, for single-wide blade):

- Height: 245 mm (9.7 in.)
- Depth: 446 mm (17.6 in.)
- Width: 29 mm (1.14 in.)
- Maximum weight: 4.6 kg (10.2 lb)

Shipping dimensions and weight (approximate for a single-wide blade):

- Height: 330 mm (13.0 in.)
- Depth: 600 mm (23.5 in.)
- Width: 175 mm (6.8 in.)
- Weight: 5.2 kg (11.5 lb)

Supported environment:

- ASHRAE class A2

- Air temperature

  - Server on:
    - 10 - 35 °C (50 - 95 °F); altitude: 0 - 914 m (0 - 3,000 ft)
    - 10 - 32 °C (50 - 89.6 °F); altitude: 914 - 2133 m (3,000 - 7,000 ft)
  - Server off: 10 - 43 °C (50 - 109.4 °F)
  - Shipment: -40 - 60 °C (-40 - 140 °F)

- Humidity

  - Server on: 8 - 80%
  - Server off: 8 - 80%

Warranty options

The BladeCenter HS23 has a three-year on-site warranty with 9x5 next-business-day terms. IBM offers the warranty service upgrades through IBM ServicePac® offerings, which are described in this section. An IBM ServicePac offering is a series of prepackaged warranty maintenance upgrades and post-warranty maintenance agreements with a well-defined scope of services, including service hours, response time, term of service, and service agreement terms and conditions.

IBM ServicePac offerings are country-specific, that is, each country might have its own service types, service levels, response times, and terms and conditions. Not all covered types of a ServicePac offering might be available in a particular country. For more information about IBM ServicePac offerings available in your country, visit the IBM ServicePac Product Selector at:
https://www-304.ibm.com/sales/gss/download/spst/servicepac

Table 17 explains the warranty service definitions in more detail.

Table 17. Warranty service definitions

Term	Description
IBM on-site repair (IOR)	A service technician comes to the server's location for equipment repair.
24x7x2 hour	A service technician is scheduled to arrive at your customer's location within two hours after remote problem determination is completed. We provide 24-hour service, every day, including IBM holidays.
24x7x4 hour	A service technician is scheduled to arrive at your customer's location within four hours after remote problem determination is completed. We provide 24-hour service, every day, including IBM holidays.
9x5x4 hour	A service technician is scheduled to arrive at your customer's location within four business hours after remote problem determination is completed. We provide service from 8:00 a.m. - 5:00 p.m. in the customer's local time zone, Monday through Friday, excluding IBM holidays. If it is after 1:00 p.m., and it is determined that on-site service is required, the customer can expect the service technician to arrive the morning of the following business day. For noncritical service requests, a service technician arrives by the end of the following business day.
9x5 next business day	A service technician is scheduled to arrive at your customer's location on the business day after we receive your call, following remote problem determination. We provide service from 8:00 a.m. - 5:00 p.m. in the customer's local time zone, Monday through Friday, excluding IBM holidays.

In general, these are the types of IBM ServicePac offerings:

● Warranty and maintenance service upgrades

  ● One, two, three, four, or five years of 9x5 or 24x7 service coverage
  ● On-site repair from the next business day to two or four hours
  ● One or two years of warranty extension

● Remote technical support services

  ● One or three years with 24x7 coverage (severity 1) or 9x5 next business day for all severities
  ● Installation and startup support for System x servers
  ● Remote technical support for System x servers
  ● Software support - Support Line
    ● Microsoft or Linux software
    ● VMware
    ● IBM Director

Regulatory compliance

The server conforms to the following standards:

- FCC - Verified to comply with Part 15 of the FCC Rules, Class A
- Canada ICES-003, issue 4, Class A
- UL/IEC 60950-1
- CSA C22.2 No. 60950-1-03
- Japan VCCI, Class A
- Australia/New Zealand AS/NZS CISPR 22:2006, Class A
- IEC 60950-1(CB Certificate and CB Test Report)
- Taiwan BSMI CNS13438, Class A;
- Korea KN22, Class A; KN24
- Russia/GOST ME01, IEC-60950-1, GOST R 51318.22-99, GOST R 51318.24-99, GOST R 51317.3.2-2006, and GOST R 51317.3.3-99
- CE Mark (EN55022 Class A, EN60950-1, EN55024, EN61000-3-2, and EN61000-3-3)
- CISPR 22, Class A

External disk storage expansion

The HS23E supports attachments to external storage expansion enclosures such as the EXP3000 series, using the ServeRAID H1135 Controller installed in the CIOv slot of the blade server (see the "Internal disk storage options" section for more information about ServeRAID H1135). HS23E can also be attached to supported external storage systems such as the DS3500 series, using the supported expansion cards listed in Table 14.

The external disk storage expansion enclosures listed in the following table are supported with HS23E.

Table 18. External storage expansion enclosures

Part number	Description	Maximum quantity supported per one blade server
172701X	IBM System Storage® EXP3000	1
174712X	IBM System Storage EXP2512 Express	1
174724X	IBM System Storage EXP2524 Express	1

SAS Connectivity Modules (one or two) must be installed into the chassis to support external disk storage expansion. The following table lists the SAS Connectivity Module.

Table 19. SAS Connectivity Modules

Part number	Description	Maximum quantity supported per one chassis
39Y9195	SAS Connectivity Module	2

The external SAS cables listed in the following table are supported with external expansion enclosures connected to SAS Connectivity Modules.

Table 20. External SAS cables for external storage expansion enclosures

Part number	Description	Maximum quantity supported per enclosure
39R6531	IBM 3 m SAS Cable	1
39R6529	IBM 1 m SAS Cable	1

The following table lists the drives supported by the EXP3000 external expansion enclosures.

Table 21. Drive options for the EXP3000 external expansion enclosures

Part number	Description	Maximum quantity supported per one enclosure
SATA 3.5-inch HDDs		
43W7630	IBM 1 TB 7200 Dual Port SATA 3.5" HS HDD	12
49Y1940	IBM 2 TB 7200 Dual Port SATA 3.5" HS HDD	12
SAS 3.5-inch HDDs		
44W2234	IBM 300 GB 15K 6 Gbps SAS 3.5" Hot-Swap HDD	12
44W2239	IBM 450 GB 15K 6 Gbps SAS 3.5" Hot-Swap HDD	12
44W2244	IBM 600 GB 15K 6 Gbps SAS 3.5" Hot-Swap HDD	12

The following table lists the drives supported by EXP2512 external expansion enclosures.

Table 22. Drive options for the EXP2512 external expansion enclosures

Part number	Description	Maximum quantity supported per one enclosure
NL SAS 3.5-inch HDDs		
49Y1903	1TB 7,200 rpm 6Gb SAS NL 3.5" HDD	12
49Y1902	2TB 7,200 rpm 6Gb SAS NL 3.5" HDD	12
90Y8720	3TB 7,200 rpm 6Gb SAS NL 3.5" HDD	12
SAS 3.5-inch HDDs		
49Y1899	300GB 15,000 rpm 6Gb SAS 3.5" HDD	12
49Y1900	450GB 15,000 rpm 6Gb SAS 3.5" HDD	12
49Y1901	600GB 15,000 rpm 6Gb SAS 3.5" HDD	12

Table 23 lists the hard disk drives supported by the EXP2524 external expansion enclosures.

Table 23. Drive options for the EXP2524 external expansion enclosures

Part number	Description	Maximum quantity supported per one enclosure*
NL SAS 2.5-inch HDDs		
49Y1898	500GB 7,200 rpm 6Gb SAS NL 2.5" HDD	12
81Y9952	1TB 7,200 rpm 6Gb SAS NL 2.5" HDD	12
SAS 2.5-inch HDDs		
49Y1896	146GB 15,000 rpm 6Gb SAS 2.5" HDD	12
49Y1895	300GB 10,000 rpm 6Gb SAS 2.5" HDD	12
81Y9944	300GB 15,000 rpm 6Gb SAS 2.5" HDD	12
81Y9596	600GB 10,000 rpm 6Gb SAS 2.5" HDD	12
81Y9948	900GB 10,000 rpm 6Gb SAS 2.5" HDD	12
SAS 2.5-inch SSDs		
81Y9956	200GB 2.5" SAS SSD	12
81Y9960	400GB 2.5" SAS SSD	12

* Note: Although the maximum number of drives supported by EXP2524 is 24, the ServeRAID H1135 Controller supports up to 14 drives in a RAID configuration, including up to two hot-spare drives. The blade server hosts two internal drives, therefore limiting the number of drives in one EXP2524 to 12.

External disk storage systems

Table 24 lists the external storage systems that are supported by HS23E and that can be ordered through the System x sales channel. The HS23E blade might support other IBM disk systems that are not listed in this table. For further information, refer to the IBM System Storage® Interoperability Center at:
http://www.ibm.com/systems/support/storage/ssic

Table 24. External disk storage systems

Part number	Description
1746A2D	IBM System Storage DS3512 Express Dual Controller Storage System
1746A2S	IBM System Storage DS3512 Express Single Controller Storage System
1746A4D	IBM System Storage DS3524 Express Dual Controller Storage System
1746A4S	IBM System Storage DS3524 Express Single Controller Storage System
181494H	IBM System Storage DS3950 Model 94
181498H	IBM System Storage DS3950 Model 98

For more information, see the list of IBM Redbooks Product Guides in the System Storage category:
http://www.redbooks.ibm.com/portals/systemx?Open&page=pg&cat=externalstorage

External backup units

The server supports the external backup options listed in Table 24. The HS23E blade may support other IBM tape backup systems that are not listed in this table. For further information, refer to the IBM System Storage Interoperability Center: http://www.ibm.com/systems/support/storage/ssic

Table 25. External backup options (part 1)

Part number	Description
External tape expansion enclosures for internal tape drives	
87651UX	1U Tape Drive Enclosure
87651NX	1U Tape Drive Enclosure (with Nema 5-15P LineCord)
Tape enclosure adapters (with cables)	
44E8869	USB Enclosure Adapter Kit
40K2599	SAS Enclosure Adapter Kit
Internal backup drives supported by external tape enclosures	
46C5399	IBM DDS Generation 5 USB Tape Drive
39M5636	IBM DDS Generation 6 USB Tape Drive
43W8478	IBM Half High LTO Gen 3 SAS Tape Drive
44E8895	IBM Half High LTO Gen 4 SAS Tape Drive
49Y9898	IBM Half High LTO Gen 5 Internal SAS Tape Drive

Table 25. External tape options (part 2)

Part number	Description
External backup units*	
362550X	IBM RDX Removable Hard Disk Storage System - External USB 500 GB Bundle
3628L3X	IBM Half High LTO Gen 3 External SAS Tape Drive (with US line cord)
3628L4X	IBM Half High LTO Gen 4 External SAS Tape Drive (with US line cord)
3628L5X	IBM Half High LTO Gen 5 External SAS Tape Drive (with US line cord)
3628N3X	IBM Half High LTO Gen 3 External SAS Tape Drive (without line cord)
3628N4X	IBM Half High LTO Gen 4 External SAS Tape Drive (without line cord)
3628N5X	IBM Half High LTO Gen 5 External SAS Tape Drive (without line cord)
3580S3V	System Storage TS2230 Tape Drive Express Model H3V
3580S4V	System Storage TS2240 Tape Drive Express Model H4V
3580S5E	System Storage TS2250 Tape Drive Express Model H5S
3580S5X	System Storage TS2350 Tape Drive Express Model S53
3572S4R	TS2900 Tape Library with LTO4 HH SAS drive and rack mount kit
3572S5R	TS2900 Tape Library with LTO5 HH SAS drive and rack mount kit
35732UL	TS3100 Tape Library Model L2U Driveless
35734UL	TS3200 Tape Library Model L4U Driveless
46X2682†	LTO Ultrium 5 Fibre Channel Drive
46X2683†	LTO Ultrium 5 SAS Drive Sled
46X2684†	LTO Ultrium 5 Half High Fibre Drive Sled
46X2685†	LTO Ultrium 5 Half High SAS Drive Sled
46X6912†	LTO Ultrium 4 Half High Fibre Channel Drive Sled
46X7117†	LTO Ultrium 4 Half High SAS DriveV2 Sled
46X7122†	LTO Ultrium 3 Half High SAS DriveV2 Sled

* Note: The external tape drives listed can be ordered through the System x sales channel. The server might support other IBM tape drives that are not listed in this table. For further information, refer to IBM System Storage Interoperability Center .
† Note: These part numbers are the tape drives options for 35732UL and 35734UL.

For more information, see the list of IBM Redbooks Product Guides in the Backup units category:
http://www.redbooks.ibm.com/portals/systemx?Open&page=pg&cat=tape

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Related publications and links

For more information, see the following resources:

- IBM US Announcement Letter:
  http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS112-083

- IBM BladeCenter HS23E product page:
  http://ibm.com/systems/bladecenter/hardware/servers/hs23e

- IBM BladeCenter Information Center:
  http://publib.boulder.ibm.com/infocenter/bladectr/documentation

- *IBM BladeCenter HS23E Installation and User's Guide*:
  http://ibm.com/support

- *IBM BladeCenter HS23E Problem Determination and Service Guide*:
  http://ibm.com/support

- ServerProven hardware compatibility page for the HS23E:
  http://ibm.com/systems/info/x86servers/serverproven/compat/us/blade/8038.html

- ServerProven compatibility page for operating system support:
  http://ibm.com/systems/info/x86servers/serverproven/compat/us/nos/ematrix.shtml

- *BladeCenter Interoperability Guide*:
  http://www.redbooks.ibm.com/big

- IBM Redbooks® Product Guides for IBM BladeCenter servers and options:
  http://www.redbooks.ibm.com/portals/bladecenter?Open&page=pgbycat

- *Configuration and Option Guide*:
  http://www.ibm.com/systems/xbc/cog/

- xREF - IBM System x Reference Sheets:
  http://www.redbooks.ibm.com/xref

- IBM System x Support Portal:
  http://ibm.com/support/entry/portal/
  http://ibm.com/support/entry/portal/Downloads/Hardware/Systems/BladeCenter/BladeCenter_HS23E

- IBM System Storage Interoperability Center:
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